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The effect of autumn and spring conditions on wheat and barley acreages

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Autumn sowing conditions represented by the logarithm of the return date measured in 10 day periods after September 1st.
Spring sowing conditions represented by the end of the 10 or 14 day work periods as given in Ag Mems 476 and 477 for moderate drainage.
Increase in acreage model as in Ag Mems 521 and 522.
Mean values found by weighting with respect to wheat acreage and total acreage.

Wheat

Year	Log Rw	A	B	Estimates (1)	Estimates (2)	Actual acreage (000s)
1960	1.0253	32	22	1965	1977	1987
1961	0.6435	17	12	1760	1752	1715
1962	0.9731	24	18	2058	2041	2127
1963	1.0719	64	51	1880	1851	1823
1964	0.9590	37	22	2032	2117	2093
1965	1.1903	28	18	2430	2430	2409
1966	0.8129	34	21	2125	2132	2150
1967	0.8195	33	22	2140	2127	2200
1968	0.8633	10	4	2371	2363	2306

A = mean number of days after March 1st to complete 14 day schedule.
B = mean number of days after March 1st to complete 10 day schedule
n = number of years after 1961 with maximum of 5.

Formula (1) Acres = $1347.5 + 863 \log R_w - 8.4A + 72.5n$
Formula (2) Acres = $1320 + 877 \log R_w - 11B + 66n$

The mean errors are 42 and 37 respectively.

After deducting the annual increase (1961-1966) factor, the partial correlations between the adjusted acres

and $\log R_w$ is 0.95
and A is -0.95
and B is -0.95

Barley plus Fallow

Year	Log R_c	A	B	Estimates (1)	Estimates (2)	Actual Acreages
1960	1.0170	30	22	3265	3262	3200
1961	0.6232	17	12	3588	3545	3631
1962	0.9590	25	19	3653	3665	3600
1963	1.0453	64	49	4233	4251	4271
1964	0.9294	37	21	4511	4466	4466
1965	1.1673	29	19	4594	4594	4684
1966	0.7782	35	21	5380	5366	5396
1967	0.7782	33	22	5365	5376	5304
1968	0.8261	10	5	5147	5163	5139

Formulae (1) $4010 - 954 \log R_c + 7.5A, + 370_n$

(2) $4030 - 966 \log R_c + 9.75B + 376.5_n$

Mean errors are 46 and 42 respectively.

After deducting the annual increase (1961-66) factor the partial correlation between the adjusted acres are

log R_c	is	-0.92
A		0.86
B		0.85

Alternative Method

The logarthmic term can be replaced by R_c and R_u with a maximum of 10 (corresponding to a date December 5, implying that later returns to capacity are unimportant).

		R_u	R_c
(Harvest)	1960	10.0	10
	1961	4.4	4.2
	1962	9.4	9.1
	1963	10.0	10.0
	1964	9.1	8.5
	1965	10.0	10.0
	1966	6.5	6.0
	1967	6.6	6.0
	1968	7.3	6.7

For wheat the formulae become

$$1550 + 71.5\ R_w - 8.8A + 83_n$$

with a mean error of 37 and partial correlations of 0.94 on R_w, -0.94 on A

or $1530 + 70\ R_w - 10.4B + 76_n$

with a mean error of 40 and partial correlation of -0.95 on B.

For barley and fallow, the formulae become

$$3850 - 82.5\ R_c + 8.7A + 356_n$$

with a mean error of 30 and partial correlations of -0.96 on R_w, 0.93 on A.

or $3820 - 83\ R_c + 10B + 364_n$

with a mean error of 37 and partial correlation of 0.94 on B.

There is no doubt that that the fit of a linear increase in acreage 1961-66 is fortuitous, but there is nevertheless ample evidence of the accuracy of the autumn parameters R_c and R_w and the spring parameters A and B as summations of the sowing conditions.

Testing a third spring parameter, the end of a 7 day schedule produced lower partial correlations. This suggests that 10-14 days is nearer the usual farm schedule.

Any comments or suggestions on this paper should be referred to the author.

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